



Japanese Patent Application Laid-Open No. 07-292943

Specification

[Claims]

[Claim 1]

A flooring material wherein a natural wood board is fixed to a plywood whose top and bottom surfaces are covered with an aluminum sheet and the total thickness of the material is made 13 mm or less.

[Claim 2]

The flooring material according to claim 1 wherein said natural wood board is a flooring.

[Detailed Description of the Invention]

[0001]

[Field of Industrial Applicability]

The present invention relates to a flooring material.

[0002]

[Prior Art]

Hitherto there have been various means for heating a room, such as gas heaters, electric heaters, electric carpets and the like. However, considering the cleanliness of air and the temperature distribution in the room, it is the best way to heat a room with a floor heating system wherein an electric heater or a hot water-circulating tube is installed under the floor and hence it has an advantage to keep a person's head cool and his or her feet warm without polluting the room air.

[0003]

Floor heating is usually carried out by introducing heat that is generated from an electric heater or a hot water-circulating tube which is installed under a flooring material, which is generally referred to as "flooring", therethrough into the room. Most of the floorings are in the form of a narrow-elongated and

matched board generally having a cross-sectional structure of three or more layers and including plywood as the base plate, the surfaces of which flooring are finished with painting.

[0004]

[Problem to be Solved by the Invention]

However, conventional floorings for floor heating have had the following drawbacks. That is, the flooring per se expands and contracts through temperature change, and thus warps particularly due to the difference of temperature between its top and bottom surfaces and also expands to a great extent due to the change of moisture content therein. In more detail, the flooring is dried and then contracted because the balance of moisture is lost by being heated. Also the moisture entering unevenly through the surfaces of the flooring causes the expansion thereof. Further the change of humidity in the room causes warp of the flooring and brakes edges and corners thereof. Needless to mention, such floorings can not be put in use. Therefore, in the related industries, floorings having no such drawbacks have been desired for many years.

[0005]

Furthermore, thinner floorings are more advantageous from the viewpoint of thermal conduction, but are limited in thickness because they are susceptible to sagging or warpage owing to the load applied thereto.

[0006]

[Means for Solving the Problems]

The flooring material of the present invention has been achieved as a result of the extensive study of the present inventor in view of the above-described current circumstances. The feature of the present invention resides in fixing integrally a natural wood board to a plywood whose surfaces are covered with aluminum sheets and setting the total thickness to be 13 mm or less.

[0007]

"Natural wood board" means a board or a laminated board, each made of natural wood as well as the above-described "flooring" and the like. The natural wood board may be those the surfaces of which are treated with resin or painted. Alternatively, the natural wood board may be those with a surface on which a sheet imitating natural wood patterns is attached. That is, any natural wood board may be used as long as it can be used as a flooring material. The thickness of the natural wood board may be within a range of from 0.3 to 5 mm.

[0008]

There is no particular restriction on the thickness of an aluminum sheet, but the thickness thereof is preferably within a range of from 0.1 to 0.5 mm. The aluminum sheet may be subjected to a rust-resistant treatment. The aluminum sheet is arranged to prevent water or moisture from penetrating into the base plate. It has been confirmed through an experiment conducted by the inventor that the plastic sheet can not be used because the expansion coefficient thereof due to temperature change is large. Other metals are not preferable because they are disadvantageous in terms of weight and costs. The aluminum sheet may be any commercially available aluminum sheet and is not required to be special in purification and accuracy.

[0009]

The aluminum sheet prevents water or moisture from penetrating into a plywood described below, i.e., the base plate, thereby preventing the occurrence of the above-described adverse affects caused by moisture.

[0010]

Furthermore, the plywood can be prevented from warping on either surface by fixing firmly the aluminum sheet thereonto. Therefore, the aluminum sheet prevents not only water or moisture from penetrating into the plywood but also the plywood from deforming because the warp of the plywood is caused by the difference in linear expansions (that are in principal caused by moisture) of the top and bottom surfaces thereof but the deflection does not occur unless the aluminum sheet expands.

[0011]

The difference of elasticity modulus between a wood such as plywood and aluminum is large and thus a plywood covered with aluminum can not bend easily. According to some experiments conducted by the inventors, a 10 mm thickness plywood with both surfaces covered with an aluminum sheet having a 0.135 mm thickness exhibited an elasticity modulus equivalent to that of a plywood having a 12 mm thickness. This means that the plywood covered with an aluminum sheet is less in bending when a load is applied thereto.

[0012]

The aluminum sheet may be fixed to the plywood by any conventional method such as adhesion. Therefore, the aluminum sheet and plywood may be adhered at their peripheral edges or whole surfaces such that they do not slide from each other. Any adhesive may be used as long as it is capable of bonding firmly metal to plywood.

[0013]

The point of the present invention lies in finding of the use of the aluminum sheet and covering the both top and bottom surfaces of a plywood therewith, the point which provides not only the above-described advantageous effects but also another advantage such as assisting heat conduction.

[0014]

"Plywood" means those formed by slicing wood into some pieces of thin sheet-like boards and then laminating a plurality of such boards such that the fiber-direction of each board is crossed at right angles to each other. Although there is no particular restriction on the total thickness of the plywood, it is preferably within a range of from 1 to 10 mm. The plywood is used as the base plate of the floor material of the present invention. The plywood is very small in the rate of expansion due to moisture or temperature change because the fiber of each board is crossed at right angles with respect to that of its adjacent board(s). Since the flooring material of the present invention is composed of the plywood having such small expansion rate and the aluminum sheet

preventing water or moisture from penetrating into the plywood, the expansion and contraction of the flooring material in the thickness-direction perpendicular to the fiber-direction of the plywood is restrained and the warp of the flooring material caused by external influences such as changes of surroundings thereof is remarkably decreased.

[0015]

The reason for setting the total thickness of the flooring material to 13 mm or less is not to prohibit heat from conducting from below as much as possible.

[0016]

Although there may be used any method for laminating four layers, i.e. a natural wood board, an aluminum sheet, a plywood and an aluminum sheet, the simplest method is to adhere these layers with an adhesive.

[0017]

In order to prevent the slippage of the flooring material after it is laid, a rubber board may be adhered partially or entirely to the bottom surface thereof.

[0018]

The flooring material of the present invention is most suitably used for floor heating as described above but not limited thereto and thus may be placed between normal boards. The flooring material of the present invention may be merely placed on a heater for heating a floor without nailing or the like.

[0019]

[Example]

The present invention will be described in more detail below with reference to the Example shown in the accompanying drawing.

Fig. 1 is a perspective view of one examples of a flooring material 1 of the present invention.

This flooring material is composed of an aluminum-plywood portion 2 and a wood portion 3 wherein the aluminum-plywood portion 2 is formed by bonding aluminum sheets 5 to the both surfaces of a plywood board 4 and the wood portion 3 is a thin flooring 6.

[0020]

A comparative experiment on thermal conductivity was conducted by the following procedure.

A conventional flooring and the inventive flooring material which is the same as that shown in Fig.1, each of which have the same thickness, i.e., 10 mm, were each placed on the same heater (hot water-circulating type panel) so as to compare the surface temperatures thereof. The experiment was conducted at a room temperature of 10°C and a panel surface temperature of 50°C. The flooring and flooring material were merely placed on the heater without nailing or the like.

The results of the experiments are set forth below.

	Surface temperature in a steady state	Warp
Conventional Flooring	27°C	A slight warp was recognized in the longitudinal direction
Inventive flooring material	29°C	No warp was recognized

It is apparent from the above results that the inventive flooring material was excellent in efficiency in temperature increase, compared to the conventional flooring. Although a conventional flooring is usually fixed to a heater with an adhesive or nails, it is certain that the system including such a conventional flooring is influenced by warp occurring over a long period of time.

[0021]

[Effect of the Invention]

The above-described present invention has the following remarkable advantageous effects.

- (1) The flooring material is large in heat conduction rate due to the use of a metal sheet. When the flooring material of the present invention is used as a flooring for floor heating, it exhibits an excellent thermal coefficient. Therefore,

it is possible to lower the temperature of the heat-source, leading to contribution to energy savings, and reduce the risk of a low temperature burn caused by contact between the flooring material and clothes or a futon (Japanese mattress).

(2) Since the top and bottom surfaces of a plywood are covered with aluminum sheets, water or moisture can be prevented from entering into the plywood thereby preventing the warp ,or expansion and contraction of the flooring material.

(3) Aluminum sheets fixed to the both whole surfaces of a plywood prevents water or moisture from penetrating thereinto. Furthermore, since the aluminum sheet is small in expansion and contraction and fixed to the plywood so as not to slip therefrom, the aluminum sheet can prevent the expansion and contraction or warp of the plywood or either side thereof due to heat applied thereto.

[Brief Description of the Drawings]

[Fig.1] is a partly perspective view of a flooring material in accordance with the present invention.

[Description of the Symbols]

- 1 flooring material according to the present invention,
- 2 aluminum-plywood portion,
- 3 wood portion,
- 4 plywood,
- 5 aluminum sheet, and
- 6 flooring.